NSG 437 ESD SIMULATOR

USER MANUAL 601-272C

AMETEK®
COMPLIANCE TEST SOLUTIONS

TESEQ
Advanced Test Solutions for EMC

NSG 437 ESD SIMULATOR

USER MANUAL 601-272C

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1 EXPLANATION OF THE SYMBOLS USED IN THIS MANUAL

Please take note of the following explanations of the symbols used in order to achieve the optimum benefit from this manual and to ensure safety during operation of the equipment.

The following symbol draws your attention to a circumstance where non-observation of the warning could lead to inconvenience or impairment in the performance.

Example:

→ **This connection must not be confused with the main power input.**

The following symbol draws your attention to a circumstance where non-observation of the warning could lead to component damage or danger to the operating personnel.

Example:

! **Never connect or disconnect the pistol while system is performing a test.**

Symbols used on the product:

Danger high voltage

Protective earth terminal

Attention refer to manual

2 SAFETY

This item of equipment, together with its accessories, works at high voltages of up to 30 kV. Any careless handling or non-observance of the operating instructions can have dangerous consequences.

The NSG 437 simualtor is not a toy! It is a professional tool and belongs only in the hands of specialists and appropriately trained personnel.

The instrument must not be switched on unless a correctly connected earth or earth cable (pulse current return path) is in place. The original earth cable supplied with the instrument is to be used. Any replacement cables must be fabricated in such a way that they cannot be accidentally connected to a mains outlet socket.

Do not touch the test finger! There is a danger of an unpleasant electric shock if the instrument is switched on (LC-display active).

Only trained personnel may operate the instrument.

Personnel fitted with a heart-pacemaker must not operate the instrument nor approach the test rig while it is in operation.

These operating instructions form an integral part of the instrument and must be available to the operating personnel at all times.

The instrument must not be used for any purpose other than testing the ESD immunity of electronic equipment.

The construction of the simulator is not designed for use in an explosive environment.

Each electrostatic discharge produces powerful electromagnetic interference.

Nearby electronic equipment can be seriously disrupted unless the appropriate counter-measures are taken. Perform ESD tests preferably in a shielded room.

If a network needs to be exchanged, the test has to be stopped first, followed by a waiting time of at least 5 s to ensure the voltage being internally discharged.

The instrument must not be opened. Repairs, maintenance work and internal adjustments are only to be carried out by a qualified service engineer.

Use the instrument only in dry surroundings. Any condensation that occurs must be allowed to evaporate before putting the simulator into operation. Long periods of exposure to sunlight and excessive warming by external energy sources are to be avoided.

Do not continue to use the instrument should any mechanical damage occur. The instrument's housing and the cable have both an insulating and a screening function, which can only be assured while the housing is intact. Return a damaged simulator to a Teseq service centre immediately for repair.

Teseq Luterbach, Switzerland and the associated sales organization accept no responsibility for personal or material damage nor for any consequential damage that results from irresponsible operation of this instrument.

3 INTRODUCTION OF ESD PHENOMENON

Under appropriate ambient conditions, both material objects and even the human body itself can become charged with electrical energy. This effect is due to "electrostatics", a phenomenon that has been known since the earliest times. Thales von Milet (600 BC) noticed how amber attracted very light particles when it was rubbed. Touching a charged item against a conductive object leads to a charge equalization through a spark discharge, which produces a brief but powerful electro-magnetic field.

3.1 Electrostatic discharge (ESD)

This effect can be explained as follows: Two insulating substances with differing dielectric constants become charged when rubbed together, i.e. one material gives electrons to the other one. This effect is known as electrostatic charging. The same can happen to a person. When somebody walks around in a dry atmosphere on carpet while wearing shoes with good insulating properties, a charge of several thousand volts can be built up. If, now, that person comes close to a conductive surface, the charge that he or she is carrying flows away through a hefty spark discharge.

The high equalizing current that flows, and the associated large electromagnetic field that hence results, can cause electronic devices (computers, terminals, process controllers, vehicle electronics, solid state devices, credit or memory cards, etc.) to malfunction or even be destroyed.

3.2 Simulation

A systematic investigation of electronic equipment and installations to determine their electromagnetic compatibility (EMC) is, today, a necessity if one is not prepared to suffer the economic disadvantages that could otherwise ensue. As a logical consequence, appropriate testing is now a legal requirement for the sale of electronic products within the EU.

The ESD test plays an important role in the range of interference sensitivity tests. It simulates frequently occurring effects and guides the development engineer to any weak spots in an instrument or item of equipment through a combination of high voltage and high frequency properties.

A simulation device must be constructed such that it reproduces practical conditions realistically. Furthermore, the results obtained (interference sensitivity threshold) must be reproducible.

The interference immunity of an instrument is not only dependent on its construction, it is also largely dependent on the quality or the consistency of the mass production techniques used. Knowing this has led to the demand for individual testing or at least random sample testing.

Further weak spots, which could affect the overall interference immunity, can arise through the assembly of instruments into complete systems because of the installation method used, the cabling and the earthing. An ESD check on systems is therefore also prescribed.

Such tests provide valuable information about the immunity of the system to effects that occur only sporadically under operating conditions and hence represent difficult to detect sources of disruption.

The ESD simulator NSG 437 fulfils the requirements of numerous applications in an ideal manner, thus:

Ergonomic shape	For non-tiring use
Operation	Operating elements and display always in view of the user. Constant check on the test values.
Microprocessor-control	All the functions are "on-board", including a pre-settable counter, pre-programmed test values, discharge voltage etc.
Precision	The test parameters are maintained precisely for reliably reproducible tests.
Flexibility	The specifications prescribed in the standards are more than fulfilled in every respect. The instrument also offers many additional handy features.
Long-term operation	Automatic long-term operation for stationary applications with the generator mounted on a tripod.
Application field	Development optimization, type-approval, EMC certification, batch testing (individually), testing of fully installed systems.

3.3 Effects on the EUT

The most significant interference components of an electrostatic discharge are of high frequency nature. The interference paths and effects have to be assessed in the range from about 30 MHz to multi-GHz.

The extremely rapid rise time of a discharge affects an object under test mostly through:

- magnetic HF-coupling between electrical conductors in the electronics and the discharge current path.
- electrical coupling between the discharge current and signal lines. A discharge current to the EUT flows proportionally through all the associated conductors (earth, mains, data lines, screening, etc.) according to their relative impedance.

Malfunctions in insufficiently immune electronic equipment and systems make themselves apparent through:

- Program crashes
- Blocking of command sequences
- Incorrect commands, statuses or data being further processed
- Partial system resets (e.g. only in peripheral modules, which lead to errors that the system does not recognize)
- Disturbance or destruction of interface modules
- Destruction of insufficiently protected MOS-components

ESD testing usually shows up all the weak spots in the HF-range of a piece of equipment simultaneously. The uses to which the NSG 437 ESD simulator can be put hence go way beyond those called for in standard-conform applications.

This instrument provides the engineer with means to detect sources of error caused by unsuitable earthing, poor ground connections, insulation problems, etc.

The simulator also serves as a reliable aid for localizing hidden wiring faults during acceptance trials on installations.

Use can also be made of the instrument as an insulation tester to determine the breakdown voltage of switches, relay contacts, insulators, etc.

4 NSG 437

By using the latest materials, construction methods and manufacturing techniques for the robust housing shell, together with highly insulated modules, the newest high voltage technology, the touch-sensitive operating panel and a control unit built using the SMD-technique, it has been possible to integrate all the functions that a comprehensive simulator system should offer into one compact instrument.

Professional industrial designers have ensured an optimized ergonomic concept. The instrument, with its well-balanced handgrip, sits comfortably in the user's hand and guarantees non-tiring operation. Both the operating elements and the display window remain in view of the user while work is in progress.

NSG 437 offers optimal freedom of movement around the workplace and is an ideal test instrument not just for the development engineer but also for quality control purposes, system tests and for investigations in the field.

As supplied in the basic set, the system is equipped with a 150 pF / 330 Ω discharge network for the IEC / EN 61000-4-2 and ISO 10605 standards.

The discharge voltage of up to 30 kV for both air-discharges and contact-discharges ensure a comfortable test margin over and above the levels called for in the standards.

The instrument is well equipped to cope with other (and future) standards. The accessories include various networks and test fingers that can be attached by the user himself.

The basic set contains everything necessary for general use. A rich assortment of accessories for special tasks is available such as discharge networks, a tripod adapter, test fingers, etc.

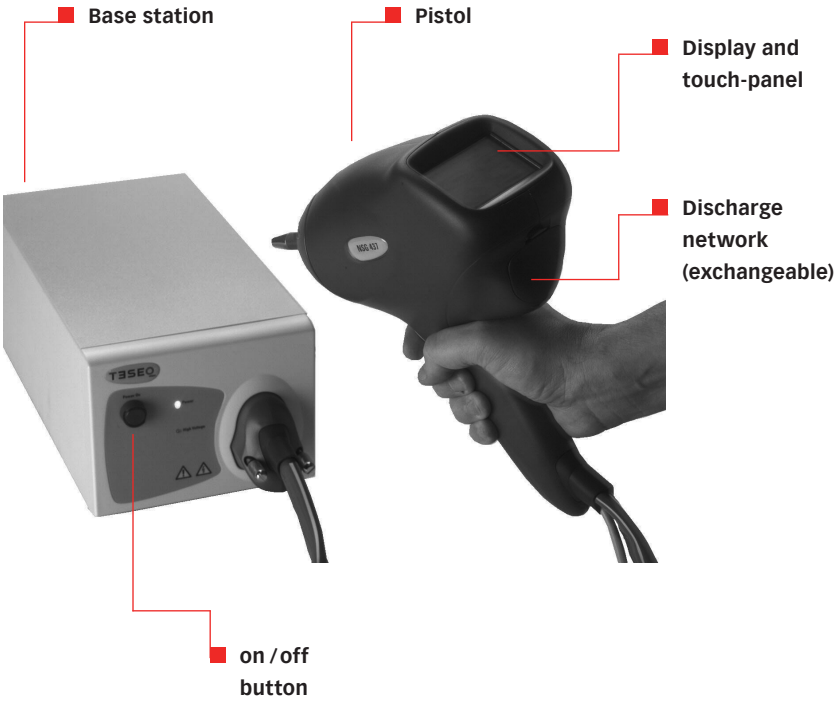
NSG 437 ESD simulator

4.1 The simulator

The NSG 437 simulator is modularly constructed from a number of discrete function units.

4.1.1 Function modules

The base station contains the high voltage generator.

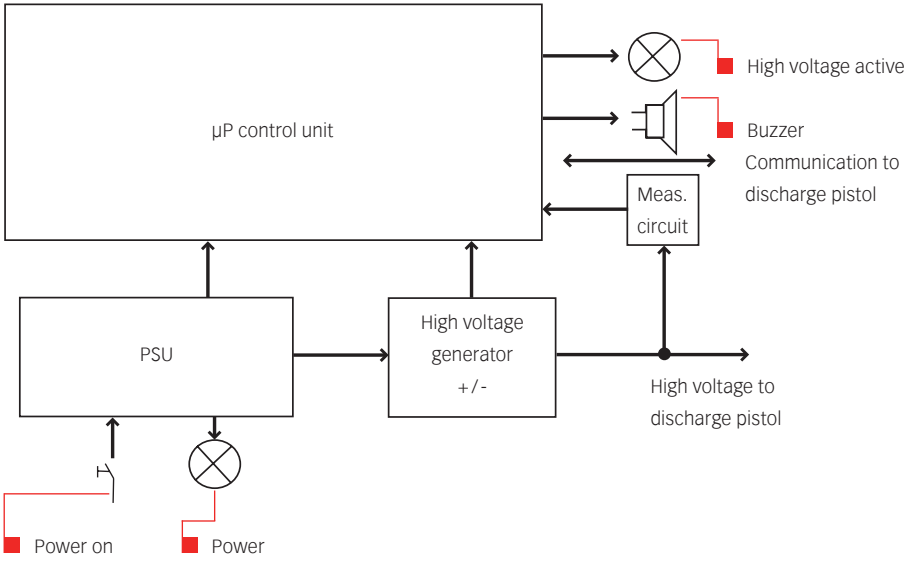


The pistol houses the interchangeable discharge network, high voltage relay, the exchangeable test finger, electronics and the touch sensitive input / display panel.

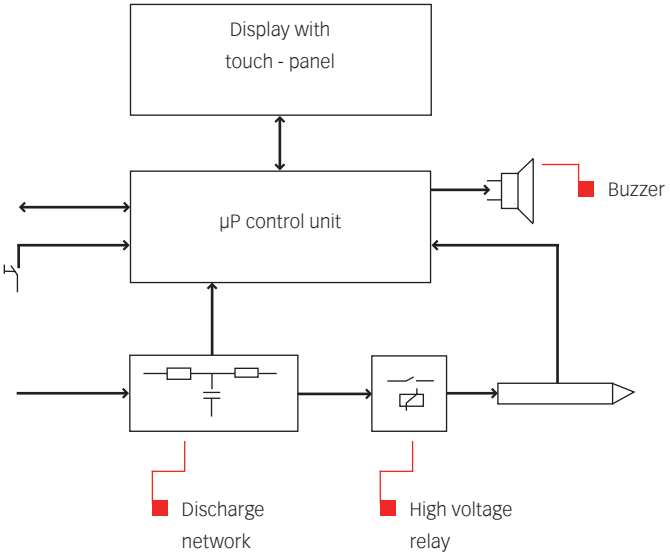
4.1.2 Block diagram

The various function units are shown in the block diagram:

Block diagram of the base station:



Block diagram of the pistol:



The microprocessor controls and monitors all the simulator functions:

- Touch-panel entries are checked for plausibility. Unacceptable entries are rejected and an acoustic warning notifies the user of the error.
- Values entered are clearly shown on the large display screen. Further information shows the operating status and the counter settings.
- High voltage generation is dynamically controlled by the processor. Varying load conditions, supply voltages, etc. can thus be taken into account and have no effect on the pulse parameters.
- The actual tip is detected and the actual discharge modus will be shown.

- The charge voltage to the network is kept constant as long as the trigger is active. The high voltage is discharged internally when the trigger is reset.
- If no discharge occurs when set for an air-discharge and the trigger is active, the processor waits for about 30 s then autonomously resets the trigger and discharges the network internally with simultaneous acoustic warning.
- A measurement facility detects an actual valid air-discharge and shows it on the display.
- Pulse triggering is monitored. Once an arc has occurred the network is discharged internally so that no further arcing is possible.

4.1.3 Operating elements

Apart from the trigger button itself (pulse triggering), all the operating elements, test-relevant setting and user information are presented on the touch-sensitive display panel facing the operator.

NSG 437 is switched on and off with the power button. Further information can be found in section "Operation". All operations are performed via touch-panel.

The function of the trigger button on the handgrip depends on the operating mode currently selected:

- As a pulse button in single discharge mode (1 pulse each time it is pressed).
- As an on/off switch in repetitive mode (discharges while button is pressed).
- As a pausing on/off switch in repetitive mode with the preset counter in operation (start the discharges by pressing the button/stop the discharges by pressing the button again).

4.2 System components

The basic ESD simulator set NSG 437 includes:

- Pistol
- Base station
- Discharge network 150 pF / 330 Ω / IEC / EN 61000-4-2 (2001)
- 1 test finger for air-discharges
- 1 test finger for contact-discharges
- Power supply unit
- Operating instructions
- Certificate of calibration

This set contains all the items necessary under normal conditions to conduct tests conforming to the IEC / EN 61000-4-2 (2001) standard.

4.2.1 Power supply unit

Power to the instrument is provided through a universal mains unit suitable for input voltages between 80 and 240 V.

4.2.2 Options

A range of additional accessories is available for special applications and for testing to alternative standards:

- Discharge networks and test fingers for other standards
- Coaxial measurement adapter type MD 101 or MD 103
- Discharge tip for fast pulse rise times <400 ps
- Flexible tip set
- Spring loaded pogo pin contact tip
- Banana socket contact tip
- 25 mm air-discharge ball
- Carrybag for base unit
- Tripod adapter
- H- and E-field adapter

4.2.3 Discharge networks

The basic set contains a discharge network and test fingers for conducting tests that conform to IEC / EN 61000-4-2 and ISO 10605 standards. Alternative networks can be installed for testing in accordance with other standards.

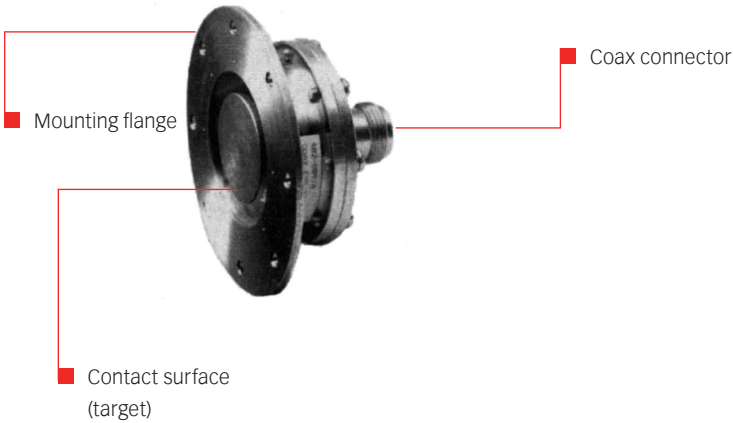
Several networks are given in the order list. The C and R values of the discharge network can also be specified for other applications. Networks conforming to other standards can be built upon request. The specifications of the standard must be fully defined.

Exchanging the discharge network is described in section "Exchanging the R / C network".

4.2.4 Measurement adapters

The measurement adapter type MD 101 as per IEC / EN 61000-4-2 (2001) serves to verify pulse amplitudes and pulse shapes. It is designed for mounting in the side wall of a Faraday cage in which an oscilloscope has been installed. This measurement adapter has the flat impedance curve to well over 1 GHz that is necessary for the purpose.

Use of this adapter is only worthwhile in conjunction with a test rig that is laid out in strict conformity with the relevant standard (see section "Verification of pulse data").



MD 103 ("Pommerenke" target) is a more advanced coaxial measuring target with flat response characteristics up to the multi-GHz range. It may be used instead of MD 101.

MD 103 with INA 103

5 COMMISSIONING

Immediately upon receipt, check the instrument and the accessories for completeness and look for any transport damage. Damage incurred in transit must be reported to the transportation undertaking without delay.

Before putting the instrument into operation:

- Study the manual
- Take the necessary safety precautions
- Connect the earth cable correctly (NSG 437 must never be switched on without a solid earth connection being made)
- Allow the instrument to dry out if any condensation has occurred

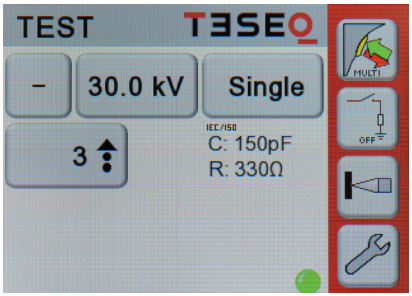
5.1 Function test

Switch the simulator on with the on / off switch.

The instrument performs audible switching operations for a few moments as it runs through a self-test and calibration procedure.

The instrument is ready for use once the self-test routines have been completed.

The default display looks as follows, while voltage, repetition rate and counter may show different values:



NSG 437 ESD simulator

High voltage generation is activated by pushing the trigger button and keeping it depressed.

By bringing the test finger close to the earthing point an arc discharge occurs which is acknowledged acoustically and the display shows the preset discharge voltage in a frame.

6 OPERATION

This section of the manual provides a guide through the numerous operating possibilities of the NSG 437.

The operation hierarchically arranged, is therefore easy to remember. The display shows unmistakable information about the parameters that have been set and the operating status of the simulator. Equally, the instrument refuses to accept any invalid entries.

It is recommended to carry out the examples directly on the instrument (not forgetting to connect the earth cable!).

6.1 Switching on

Plug the pistol HV connector into the base station and tighten both knurled screws.

> **!** **Ascertain that the base station as well as the earth cable for the pulse return path is solidly connected to the fixed installation's earth point.**
>
> **There is a danger of electric shock if this is neglected!**

Press **the power on** button. The green **power** LED will light up. The red **high voltage** LED blinks while the pistol runs its self-test and calibration routine.

The instrument is ready for use immediately after self-test and calibration procedures have been completed. High voltage generation is activated by pressing and holding the trigger button. The active high voltage state is indicated on the base station by a blinking red LED.

Should a parameter need changing the operator has only to press on the relevant field in order to call up the appropriate menu.

The value of discharge voltage is displayed following a successful air discharge. A differentiation is made between this and the set value by the display kV flashing green. If no valid discharge occurred, the display shows a 0 value and the kV symbol will flash red. The threshold function (see section "Threshold") permits to switch off this detector.

The effective discharge voltage depends on various factors such as the distance to the discharge point, speed of approach, nature of the EUT, etc.

In the case of a contact-discharge this measurement is not carried out since only a discharge current can occur.

Switch power off, all data will be reseted to the defaut value.

6.2 Operation and settings

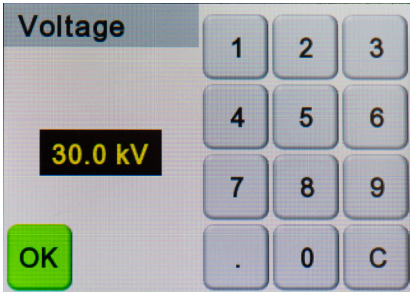
The operation of the instrument and all settings are carried out by way of the touch-panel starting from the following menu:

- Frames symbolize push buttons. Touching these sensitive areas causes a reaction, usually branching into another menu.

- Values and indications that are not in frames are for information only. Pressing the Trigger button always brings you one menu level higher.

6.2.1 Display

Numerical values (voltage, preset counter, repetition times) can be entered just the same as with a pocket calculator.



Selection functions (such as language, type of discharge, program number, etc.) are handled by up / down buttons to scroll through the settings.

6.2.2 Voltage

Touching the voltage indication brings you to the submenu for adjusting the discharge voltage. Set the required value and press "Ok".

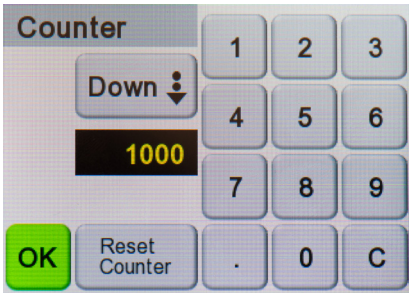
6.2.3 Polarity

Touching the polarity indication brings you into the relevant submenu. Choose between + or –. If the pre-select counter function is active there is a further option of choosing alternating +/- polarity.

Around the max. voltage range some minor delay for triggering shall have to be expected (fully discharging-changing-recharging).

6.2.4 Counter

Use the counter button to branch into the corresponding menu. Choose the counter mode: Preset counter on / off. In the "on" state the counter content can be set. When the generator is in operation the preset counter counts down until it reaches 0, which then terminates the selected test sequence.



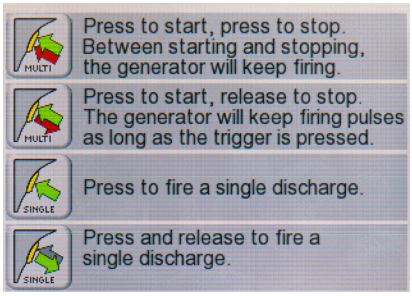
To use the continous operation mode the preset counter has to be switched off and the number has to be 0. - - - - means continuous operation without any preset counter function. Pressing the trigger button starts the generator operating; a second press on the same button stops the operation.

Reset counter sets the counter content to 0 or it reloads the preset counter with the previously selected value.

Pulse release behaviour

Four modes of triggering are supported:

- Press to Start, Pess to Stop
- Press to Start, Release to Stop
- Single (on Press)
- Single (on Release)


MULTI
Press to start, press to stop. Between starting and stopping, the generator will keep firing.
MULTI
Press to start, release to stop. The generator will keep firing pulses as long as the trigger is pressed.
SINGLE
Press to fire a single discharge.
SINGLE
Press and release to fire a single discharge.

6.2.5 Repetition

The repetition button brings you into the menu to select either single pulses or a repetition rate from 0.5 to 25 Hz in air-discharge, or from 0.5 to 20 Hz in contact-discharge mode.

6.3 Settings

This further branches into a range of submenus, thus:

6.3.1 Language

Touch the button and choose the language you wish.

6.3.2 Discharge

Depending on mounted finger tip the sign shows the actual discharge-mode.

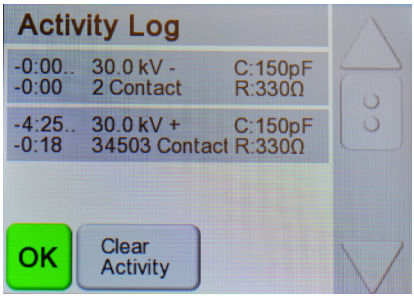
The corresponding value is automatically loaded. The mode can be changed using the up/down buttons to select the desired mode.

air-discharge	= round test tip
contact-discharge	= sharp point test tip

6.3.3 Activity Log

An activity log is provided, allowing the user to scroll through the tests shown in hours and minutes before the present. Changing the relevant test parameters will cause a new entry into the log to be created.

The Log is in volatile RAM and will be reset each time the gun is switched off!

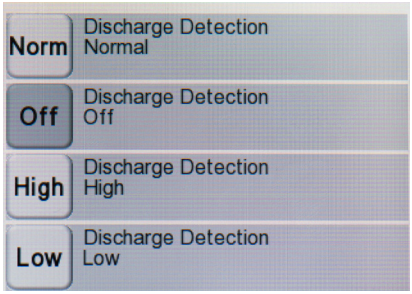


6.3.4 Threshold

This function permits to switch the threshold to "normal" or "off".

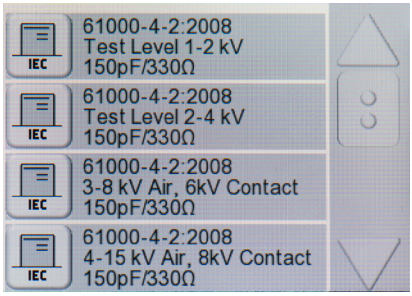
Normal: Arcing is detected and is indicated by the kV symbol on the display blinking provided 20% (or more) of the charge voltage is dissipated.

Off: This means in contact-discharge mode, the arcing detection is disregarded and the counter counts up / down as per settings in the repetition or counter menu respectively. This position is made for EUTs with non-conductive surfaces (housings).



6.3.5 Standards

Provides the means to select the required, pre-programmed standard test (e.g. IEC / EN 61000-4-2, Level 4).



6.3.6 Continuous operation

Continuous operation can be established to produce a repetitive stream of discharges.

Pushing the trigger button starts the continuous operation; pressing it again stops the operation.

!

- **Continuous operation should only be utilized in cases of real necessity since every ESD radiates electromagnetic disturbance the effect of which on the environment must be taken into consideration.**
- **The test area should be made out of bounds for unauthorized personnel.**
- **The test must be monitored throughout its duration.**

7 TEST PROCEDURES

Test standards, such as IEC/EN 61000-4-2 (2001) for example, give detailed information about the assembly of the test rig, the associated organization, the EUT itself and the documentation.

7.1 Standard-compliant procedures

The ESD simulator system type NSG 437 is constructed in accordance with the requirements called for in the standard and is calibrated in a standard-conform manner.

The test engineer is duty-bound to study the relevant test requirements and adapt the facilities to suit the EUT in question.

The necessary documents can be obtained directly from the offices of CENELEC (www.cenelec.org), the IEC (www.iec.ch), the ANSI (www.ansi.org), the IEEE (www.ieee.org) etc., or they are available from national standards bureau.

7.2 Other situations

It is not always possible to arrange a test rig in exact conformity with the relevant standards. However, by abiding by some basic rules, it is still possible to obtain meaningful assessments of a EUT's sensitivity to interference and to obtain valuable pointers to improving its immunity.

An electrostatic discharge is always associated with high frequency properties, which extend well above the 1 GHz range. Screening, earthing and filtering measures must therefore also be effective up into this range of frequencies.

The possible paths the pulse energy might take need to be thought about. It is absolutely essential the pulse return path is fed back through the generator's earth cable.

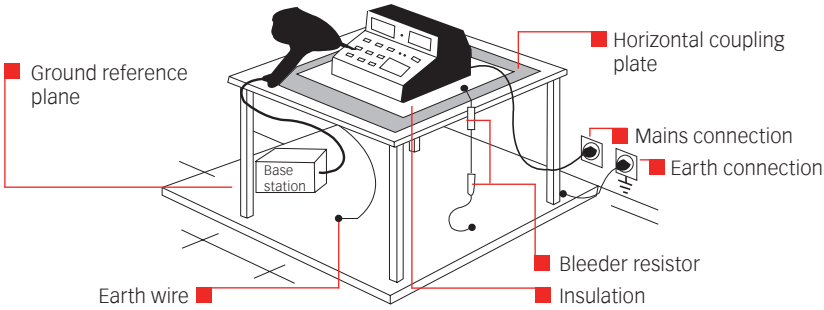
The contact-discharge method is to be preferred over the air-discharge method.

The former must, however, be arranged so that true metal-to-metal contact with the EUT is achieved.

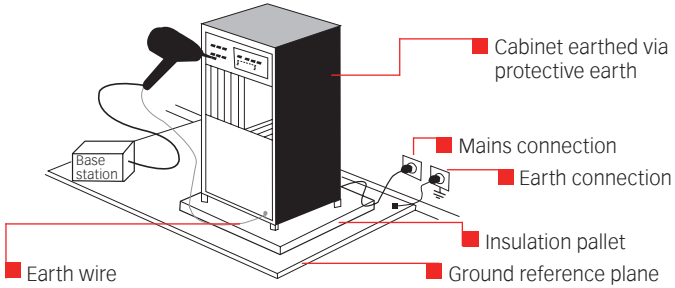
Repetitive discharges are only of real use to quickly localize weak spots in construction or to pin-point critical situations in program routines. Single pulses are then to be used for detailed investigations and to assess the sensitivity to interference.

An exact record is to be kept describing the test conditions complete with photos of the test rig, details of the type and quantity of discharges, notes about the ambient climatic conditions, remarks concerning the effects observed etc.

Example of test set-up for table-top equipment – laboratory tests



Example of test set-up for floor-standing equipment – laboratory tests



NSG 437 ESD simulator

8 VERIFICATION OF THE PULSE DATA

The calibration and verification of the pulse data requires a specialist test and measurement laboratory for which the IEC standard sets out certain minimal requirements.

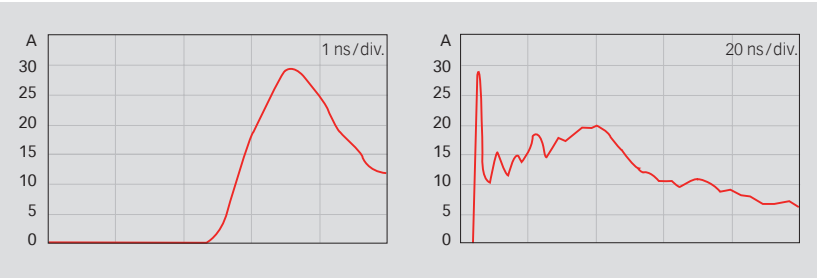
Teseq uses the following instruments for calibration purposes:

- Oscilloscope with an analogue bandwidth of min. 1 GHz
- Coaxial measurement adapter MD 101 Pellegrini-target as per IEC / EN 61000-4–2 (2001) or MD 103 according to latest draft
- 20 dB attenuator covering the range from dc to 12.4 GHz
- SUCOFLEX-HF-coaxial cable
- High voltage DC voltmeter (Ri >30 GΩ)

The instruments are periodically recalibrated in accordance with the requirements of ISO 17025.

Calibration installation with oscilloscope in a Faraday cage.

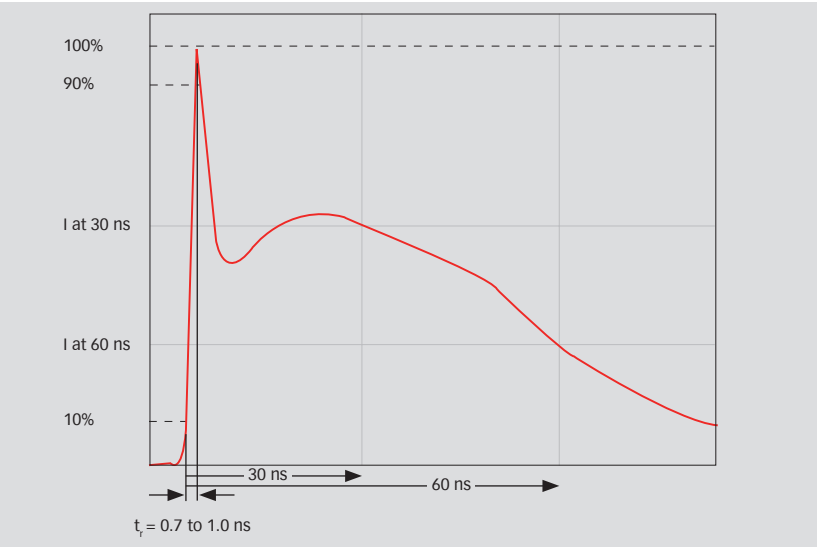
9 TYPICAL PULSE DATA



Contact-discharge 8 kV
pulse rising (t_r ca. 0.8 ns)

Contact-discharge 8 kV
current at 30 ns and 60 ns

Reference figure quoted in IEC/EN 61000-4-2 (2001)



NSG 437 ESD simulator

10 MAINTENANCE

Care

The housing can be cleaned with a moist cloth with possibly just a trace of detergent liquid. Industrial spirit is also a suitable cleaning agent. Other solvents are not permitted.

Fuses

The instrument contains no fuses that are accessible to the user.

10.1 Calibration

Trimming procedures in the NSG 437 are carried out digitally and automatically. The instrument contains no elements that are foreseen for adjustment by the user. A component defect must be suspected if the calibration measurements differ from the published technical data and the instrument is to be returned to an authorized Teseq service centre.

Measurements can only be undertaken by trained specialists. A prerequisite is the availability of the necessary measurement equipment as listed in section "Verification of pulse data".

Charge voltage check:
Equipment: EHT voltmeter with 40 kV voltage range
Internal resistance >20 GΩ.
Measurement accuracy <1%

Check the voltage level under the following conditions:
Air-discharge
Single-discharge
Polarity: positive and negative
Voltage settings: 2, 4, 8, 15 and 30 kV
Permissible tolerance < ± 5% of set value

Check the discharge current and pulse form as follows:
Contact-discharge
Single-discharge
Polarity: positive and negative
Voltage settings: 2, 4, 8, 15 and 30 kV

Compare the measured values with the reference data in IEC / EN 61000-4-2.

These values are valid only for the discharge network that conforms to IEC / EN 61000-4-2.

Remark
Teseq offers an accredited service for this kind of work!

10.2 Exchanging the R / C network

If a network needs to be exchanged, the test has to be stopped first, followed by a waiting time of at least 5 s to ensure the voltage being internally discharged.

Switch the simulator off.

Open the flap under the display and rotate the pistol backwards until the network drops out under its own weight. Take care! Catch the network in the other hand.

10.2.1 Reduction of the pulse repetition rate through higher capacity

The maximum achievable pulse repetition rate can suffer as a result of using special discharge networks having a higher capacity. No other limiting effects occur, however.

10.3 Repairs

Repair work is to be carried out exclusively by an authorized Teseq repair department.

Voltages in excess of 30 kV are generated within the instrument: LETHAL DANGER!

Only original replacement parts and accessories are to be used.

Do not continue to use the instrument in the event of mechanical damage occurring. The plastic housing also performs insulating and protective functions, which are only assured as long as it is in its original condition. A damaged instrument should be returned without delay to a Teseq service centre.

10.4 NSG 437 system error messages

Nr.	Text	Explanation	Action
125	HV SUPPLY TIMEOUT	The HV cannot be loaded in the specified time.	HV voltage module has detected during measurement an uncertainty. Switch off the base station wait for 10 s, switch on again.
126	HV SUPPLY TIMEOUT	Unit stops after 30 s without discharge.	Press return on screen. Restart the test.
127	HW FAULT	An internal fault on the processor board has been detected.	Switch off the base station wait for 10 s, switch on again and continue testing. If error persists, contact your nearest Teseq service centre.
129	A FIELD IS SELECTED	The "run" or the "HV-on" key has been pressed although an operator field is still selected.	Finish the input in the operator field and then start with "run".
201	HV INTERNAL DISCHARGE	During test, an internal discharge has been detected.	Press return on screen and trigger again. If error persists, contact your nearest Teseq service centre.
210	ERROR ADJUST FAILURE <xxx>	HV module can not reach the max. voltage during calibration procedure.	The voltage can be selected to the displayed maximum value. Contact you nearest Teseq service centre.
211	FAULT DETECTED	The software has found erroneous behavior during generation of the pulse.	Stop the test. Switch off the base station wait for 10 s, switch on again and continue testing. If error persists, contact your nearest Teseq service centre.

217	VOLTAGE TOO HIGH	The selected value is too high.	Reduce the voltage level.
247	HV TRAFO TOO HOT	NTC resistor too hot after endurance runs.	Power off the NSG 437 and wait about 1h.

10.5 Disposal

The following list shows the principal materials used in the construction of the NSG 437. The relevant national regulations are to be observed when disposing of the instrument.

Component material listing

Pistol housing	ABS
Base station front panel	ABS
Base station housing	Galvanized steel, lacquered
Circuit boards	Epoxi with SMD components
LCD display and touch-panel	Glass
HV module	Polyurethane potting compound with elect. network components and copper wire
HV relay	Div. metals, ceramic, div. insulating materials, SF6 insulating gas
Test finger	Brass, plastics
Power supply	ABS housing with transformer and circuit board with electr. components

10.6 Declaration of conformity CE

TESEQ
Advanced Test Solutions for EMC

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Declaration of conformity

CE

Manufacturer:	Teseq AG
Address:	Nordstrasse 11F, 4542 Luterbach, Switzerland
	declares that the following product
Product:	NSG 437 ESD Simulator
Options:	all
	conforms to the following Directives and Regulations
	EMC Directive 2004/108/EEC LVD Directive 2006/95/EEC
Generic standards:	EN61326-1, 2005 EN61010-1, 2001
	The relevant technical file is available for inspection:
Technical file:	N° EMC437_2007 / LVD437_2007 Teseq AG CH - 4542 Luterbach

The purpose of this instrument is the generation of defined interference signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems. The user himself or herself is ultimately responsible for the correct and controlled operation of the rig. In case of doubt, the tests should be carried out in a Faraday cage.

European representative:	Teseq GmbH, Landsberger Str. 255, 12623 Berlin, Germany
Place and Date:	Luterbach, July 24th, 2007

Johannes Schmid
President

11 TECHNICAL SPECIFICATIONS

Description	Compact ESD simulator with microprocessor-based, large touch-sensitive LCD panel, built-in HV relay for contact-discharge, mains operation
Basic set	Package with: ■ Discharge pistol ■ High voltage base unit ■ Mains power supply adapter (100 to 250 VAC) ■ Discharge network 150 pF / 330 Ω ■ Air- and contact-discharge tips ■ Grounding cable ■ User manual
Pulse data	Standard: Conforms to IEC / EN 61000-4-2 and ISO 10605 Special: Interchangeable networks for other standards
Pulse networks	Network 150 pF / 330 Ω as per IEC / EN 61000-4-2 (included) Optional ISO 10605 networks 150 pF / 2 kΩ and 330 pF / 2 kΩ. Range of RC networks for other standards: R = 0 to 20 kΩ C = 50 to 2000 pF
Discharge voltage	Air-discharge: 200 V to 30 kV (in 100 V steps) Contact-discharge: 200 V to 30 kV (in 100 V steps)

Discharge tips	Ball and point as per IEC and specials; exchanged by threaded cap
Charging voltage measurement	kV, accuracy better than ±5% (stabilized)
Discharge detection (air-discharge only)	Indicated by the kV symbol being displayed in inverse, also acoustically in the "Single" operating mode. Threshold level on / off
Holding time	>5 s (charging voltage ±5%)
Charge resistor	50 MΩ
Triggering	Trigger button in handgrip
Operation	Via touch screen and microprocessor
Discharge modes	Air-discharge / contact-discharge
Polarity	Positive / negative / automatic change
Operating modes	Single / repetitive Pulse counter 0 to 9999 Pre-select counter 0 to 9999 Repetition: ■ 0.5 / 1 / 5 / 10 / 20 or 25 Hz (air) ■ 0.5 / 1 / 5 / 10 / 20 or 20 Hz (contact) ■ continuous operation
Display	LCD panel showing: ■ Charging voltage ■ Breakdown event ■ Polarity ■ Air- / contact-discharge ■ Counter / preselect counter content
Weight	Discharge pistol (w / o cable): 1.2 kg (2.6 lbs) approx. Base unit: 5.7 kg (12.6 lbs) approx.
Ambient conditions	Operation: +5 to +40°C 20 to 80% r.h. (non-condensing) 68 to 106 kPa

12 ESD STANDARDS

The IEC / EN 61000-4-2 standard can be taken as a working basis.

This has been renamed from IEC 801-2, 1991 into IEC 1000-4-2 as well as IEC / EN 61000-4-2 (2001) and will be accepted into national standards as part of the European harmonization.

The following documents are either identical or largely compatible:

IEC / EN 61000-6-1	Generic immunity standard for residential and light industrial environments.
IEC / EN 61000-6-2	Generic immunity standard for industrial environments as well as others.

Major standard for automotive industry:

ISO 10605	Road Vehicles – Test mehtods for electrical disturbances from electrostatic discharge.

13 WARRANTY

Teseq grants a warranty of 2 years on this instrument, effective from the date of purchase.

During this period, any defective component part will be repaired or replaced free of charge or, if necessary, the instrument will be replaced by another of equivalent value.

The decision regarding the method of reinstating the functional capability is at the sole discretion of Teseq.

Excluded from the warranty is damage or consequential damage caused through negligent operation or use as well as the replacement of parts subject to degradation.

The warranty is rendered invalid by any intervention on the part of the customer or a third party.

The goods are to be returned in the original packing or other equivalent packing suitable for the purpose of the foreseen means of transport.

Teseq can accept no responsibility for damage in transit.

14 ACCESSORIES

NSG 437
Basic set (see technical specifications)

Accessories NSG 437	Part number
Discharge network ISO 10605, 150 pF / 2 kΩ	INA 4381
Discharge network ISO 10605, 330 pF / 2 kΩ	INA 4382
Discharge network ANSI C63.16, 150 pF / 330 Ω	INA 4383
Discharge network ANSI C63.16, 150 pF / 75 Ω	INA 4384
Discharge network ANSI C63.16, 150 pF / 15 Ω	INA 4385
Special discharge networks, specify standard and / or values of R and C	INA xxxx
Fast risetime test tip <400 ps	INA 4411
Tripod support	INA 4421
ESD measurement target conforming to IEC / EN 61000-4-2 (2001)	MD 101
ESD measurement target (ANSI and IEC draft)	MD 103
Ground cable with resistors (2x 470 kΩ) Test bench: upon request	INA 414
Discharge tip with 0.5 m flexible cable	INA 4413
Air-discharge ball	INA 4414
Flexible tip set	INA 4415
Soft touch contact tip	INA 4416
Banana socket contact tip	INA 4417
Banana socket fast rise time tip	INA 4418
E-field adapter	INA 4419
H-field adapter	INA 4420

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